3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This section describes the current condition of resources in the study area that may be affected by the Proposed Action. Resources and related topics presented include geomorphology and soils, hydrology and hydraulics, water quality, cultural resources, air quality and noise, fish and wildlife, vegetation and wetlands, threatened and endangered species, socioeconomics, visual and aesthetic resources, net water depletions, environmental justice, and Indian trust assets.

The Albuquerque Reach of the Rio Grande extends from the Angostura Diversion Dam to the Isleta Diversion Dam (Figure 1.1). This area has been identified by Reclamation and the ISC, as well as the Collaborative Program, as being a reach of the Rio Grande where habitat/ecosystem restoration projects would be highly beneficial to all life stages of the RGSM.

3.2 GEOMORPHOLOGY AND SOILS

The MRG lies in an asymmetric, elongated valley along the Rio Grande Rift (Chapin 1988; Hawley 1978). The Rio Grande rift valley is dominated by connected alluvial-filled sub-basins defined by normal faulted mountain ranges. The land flanking the Rio Grande Basin on the east is predominantly mountainous, with merging colluvial-alluvial fans and stream terraces sloping down and westward toward the Rio Grande. The geologic surface west of the river is ancestral Rio Grande alluvial deposits with isolated mountains and volcanoes. Near Albuquerque the land surface generally slopes up to a rolling divide to the Rio Puerco (this surface is known as the Llano de Albuquerque) (Bartolino and Cole 2002). The river channel flows in a wide valley with a fertile but narrow (2-3 mile wide) floodplain that has been cultivated for centuries.

Historically, the shape and pattern of the Rio Grande channel have continuously redefined the spatial distribution of sediments throughout the floodplain. However, in the twentieth and twenty-first centuries, floodway constriction and channel stabilization projects have altered the natural course of the river. For example, flow regulation by dams, levees, and jetty jacks have been used to control the location of the channel, preventing flow from reaching the historic floodplain and causing sediment to accumulate in some areas and scoured in others (MEI 2003).

Sedimentology and fluvial geomorphology play an important role in describing the evolution of the Rio Grande and in influencing the spatial extent and species diversity of vegetation in riparian areas. The present-day channel is composed of clay, silt, sand, and gravel, similar to the composition of ancestral river deposits. In addition to the erosion and transportation of sediment through the main-stem channel, tributary streams can contribute large volumes of sediment to the system. The historic floodplain in other reaches, such as the Albuquerque Reach, has become disconnected from the river (MEI 2003).

The soils of the Rio Grande Valley floor are generally derived from recent alluvial deposits. The two soil mapping units that occur within the proposed project area are the Vinton and Brazito Soils, occasionally flooded, and the frequently flooded Torrifluvents (U.S. Department of

Agriculture [USDA] 1977). There is a wide range of soil textures but they are mostly characterized by sand, loamy sand, or sandy loam. Also, these soils range from slightly saline to strongly saline and are moderately alkali affected.

3.3 HYDROLOGY AND HYDRAULICS

The MRG is the portion of the Rio Grande from the Colorado/New Mexico state line southward to the headwaters of Elephant Butte Reservoir, and includes the Rio Chama watershed. Most of the annual flow and discharge of the Rio Grande that reaches the MRG is generated in the headwaters of the river basin in Colorado and in the Rio Chama in northern New Mexico.

Most of the discharge volume of the Rio Grande is late spring snowmelt. Late summer monsoon events produce runoff and briefly alter the hydrograph of the river. These summer flows typically carry high sediment loads; however, the operations of Cochiti Dam since 1973 have greatly reduced the total supply of sediment throughout the Albuquerque Reach (SSPA 2004). Human activities have produced significant changes in the hydrology of the Rio Grande during the past century. The operation of upstream dams (Heron, El Vado, and Abiquiu Reservoirs on the Rio Chama, Jemez Dam on the Jemez River, and Cochiti Dam on the Rio Grande) affects flows in the river by storing and releasing water in a manner that generally decreases the spring flood peaks and alters the timing of the annual hydrograph. Of the 100 greatest daily discharges since 1942 at the Central Gage (8330000), all have occurred prior to the construction of Abiquiu and Cochiti dams (USGS 2003). However, these operations do not cause significant changes in the annual flow volume. According to USGS gage data, average daily flow for the Central Gage from 1942-1974 was 1042.70 cubic feet per second (cfs), while average daily flow from 1975-2002 was 1395.75 cfs.

3.4 WATER QUALITY

Current information for the water quality of the river system in the MRG is available from the U.S. Geological Survey, the USACE, Reclamation, the University of New Mexico (UNM), the New Mexico Environment Department, USFWS and other sources. Water quality constituents that are typically monitored include surface water temperature, pH, turbidity, dissolved oxygen (DO), suspended sediments (SSED), conductivity/total dissolved solids (TDS), and fecal coliform. These data may be collected in the Rio Grande, in adjacent canals, or within reservoirs. Typically, the data are collected with automatic data logging devices at stream gaging locations, or by personnel at specific riverine, canal, or reservoir locations

The available data for the Albuquerque Reach is characterized by a high degree of seasonal variability for several water quality measures, as shown in Table 3.1.

Table 3.1. Average Water Quality Data by Constituent for the Central Avenue Gage (1975-2001) (USGS 2003)

Season	Turbidity (NTU)	DO (mg/L)	pH	Conductivity (mg/L)	Water Temp (°C)	TDS (mg/L)	Fecal coliform (col/100mL)	SSED (mg/L)
Nov-Feb	9.12	10.19	8.08	391.86	6.66	255.08	N/A	539.01
Mar-June	45.57	8.66	7.97	359.11	15.90	209.74	82.50	1167.12
July-Oct	25.67	8.03	8.13	387.95	18.89	273.17	8.00	2114.67

New Mexico Environment Department water quality standards exist for reaches and subreaches throughout the State of New Mexico including the Albuquerque reach. The water quality standards listed below are from the New Mexico Water Quality Control Commission as amended through October 11, 2002, and are for the Albuquerque Reach between Sandia and Isleta pueblos.

NEW MEXICO WATER QUALITY STANDARDS (20.6.4.105):

A. Designated Uses: irrigation, limited warm water fishery, livestock watering, wildlife habitat, and secondary contact.

B. Standards:

(1) In any single sample: pH shall be within the range of 6.6 to 9.0, and temperature shall not exceed 32.2°C (90°F). The use-specific numeric standards set forth in 20.6.4.900 New Mexico Administrative Code (NMAC) are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of fecal coliform bacteria shall not exceed 1,000/100 mL; no single sample shall exceed 2,000/100 mL (see Subsection B of 20.6.4.13 NMAC)

(3) At mean monthly flows above 100 cubic feet per second (cfs), the mean monthly average concentration for: TDS shall not exceed 1,500 mg/L, sulfate shall not exceed 500 mg/L, and chloride shall not exceed 250 mg/L

(4) Narrative standards are those set forth in section 20.6.4.12 of the State of New Mexico Standards for Interstate and Intrastate Surface Waters. These include, but are not limited to:

i. Bottom Deposits – Surface waters of the State shall be free of water contaminants from other than natural causes that will settle and damage or impair the normal growth, function, or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom.

ii. Plant Nutrients – Plant nutrients from other than natural causes shall not be present in concentrations which will produce undesirable aquatic life or result in a dominance of nuisance species in surface waters of the state.

iii. Turbidity – Turbidity attributable to other than natural causes shall not reduce light transmission to the point that the normal growth, function, or reproduction of aquatic life is impaired or that will cause substantial visible contrast with the natural appearance of the water.

3.5 CULTURAL RESOURCES AND TRADITIONAL CULTURAL PROPERTIES

Cultural History

Cultural resources include archaeological sites, sites eligible for the State Register of Cultural Properties (SRCP) and/or the National Register of Historic Places (NRHP), and properties of traditional religious or cultural importance (traditional cultural properties [TCPs]).

The indigenous population in the Rio Grande Valley of New Mexico dates back at least 12,000 years (Cordell 1997). The steady influx of people of European descent into the Rio Grande Valley of present-day New Mexico from the sixteenth century onward has given rise to a diverse cultural mosaic and has left a multitude of varied cultural resources that are more than 50 years old. The state was part of the Spanish Colonial Empire until Mexico won its independence in 1821. Twenty-five years later, in 1846, New Mexico was claimed by the United States. These successive cultures have left archaeological sites (habitation, mining, industrial, and other), standing structures, bridges, utilities, and a network of irrigation canals and acequias more than 50 years old (Arrowsmith 1963; Cordell 1997; Rivera 1998; Van Citters 2003).

Archaeological resources in the Albuquerque Reach of the Rio Grande floodplain are limited because of poor preservation, the result of a long history of agricultural use of the valley floor, and development of the metropolitan area (for the most part on private lands) prior to the existence of a preservation ethic. Historical records emphasize protohistoric and historic settlement in the North Valley between Albuquerque and Bernalillo (Sargeant 1985; Campbell 2001), and archaeological work on the West Mesa has contributed a great deal to our understanding of regional prehistory (Schmader 1991, 1994).

Archaeological resources that are listed on the National Register for Historic Places, or eligible for listing are protected under the National Historic Preservation Act (NHPA) of 1974 (16 U.S.C. 470). To determine if any cultural resources sites known to be listed on or eligible for the NRHP are within the project area, SWCA conducted a records search for the proposed project in the Archaeological Records Management Section (ARMS) database of the New Mexico Historic Preservation Division. Twelve archaeological sites are within one-half mile of the boundaries of the project area, and 24 are within one mile. Sites outside the project area are found on the edge of the floodplain (outside the artificial levees) or, more commonly, on benches or mesa surfaces just outside the floodplain. No known sites are located within the project area.

Traditional Cultural Properties

Reclamation has consulted with Native American Tribes and Pueblos that may have an interest in the Project and project area to determine if there are any Traditional Cultural Properties (TCPs) that must be considered in the decision-making process. The consultations are being conducted on a government-to-government basis. Because of the sensitive nature of the Rio Grande and its islands for Native Americans, no decision will be made regarding this proposed action prior to conclusion of the Tribal consultations.

3.6 VEGETATION AND WETLAND RESOURCES

The riverbank community along the MRG consists of open sand bars along the main channel. These areas are subject to frequent disturbance from erosion and flood events and typically have little or no vegetation. Sparse growth of young cottonwood (*Populus deltoides*), coyote willow (*Salix exigua*), tamarisk (*Tamarix* sp.), and a variety of annual forbs is occasionally found. Since these areas experience regular scouring during flood events, the vegetation typically does not mature. Like the riverbank riparian vegetation, characteristics of vegetated islands within the river channel have changed significantly. Perhaps due in part to the lack of flood peaks during the current drought, vegetated islands currently support upwards of 18 percent of the vegetation throughout the Albuquerque Reach (Milford et al. 2003).

An increase in non-native vegetation has been identified as the most significant indicator of failing ecological health in the riparian ecosystem. Species such as tamarisk, Russian olive (*Elaeagnus angustifolia*), and Siberian elm (*Ulmus pumila*) have more extensive reproductive cycles than native species, allowing them to out-compete native trees in many locations. The fact that flood peaks have been reduced and the river has incised through the Albuquerque Reach also factor in the transformation of riparian forests, since the non-native species are more tolerant of reduced floods and lower water tables.

Despite the considerable attention that has been devoted to the ecology and biodiversity of the neighboring riparian bosque (Hink and Ohmart 1984; Crawford et al. 1993), little is known about the in-channel bars, which are perhaps its most diverse and biologically active component. These dynamic environments support young wetland and riparian vegetation along with most of the natural regeneration of Rio Grande cottonwoods in the river corridor (Milford and Muldavin 2004).

A narrow band of herbaceous wetland plants dominated by inland saltgrass (*Distichlis spicata*) and Baltic rush (*Juncus balticus*) occurs on the banks of the Rio Grande. Other species that occur in the floodplain include isolated stands of rabbitbrush (*Ericameria nauseosa*), common mullein (*Verbascum thapsus*), coyote willow, Russian olive, and tamarisk. Dominant plant species found in the bosque are Rio Grande cottonwood (*P. deltoides wislizenii*) and oneseed juniper (*Juniperus monosperma*). Within the Rio Grande, most in-channel islands and bars are periodically inundated by high flow and support some marsh, meadow, or shrub wetland communities. However, the islands targeted for the Proposed Action are dominated by non-native vegetation and contain limited wildlife habitat.

3.7 FISH AND WILDLIFE

Changes in the river elevation relative to the floodplain and the hydrologic and sediment regime as well as the introduction of predatory species (game fish) have affected the fauna of the Rio Grande. Historically, the riparian corridor of the MRG supported a wide diversity of terrestrial species. Prior to increased anthropogenic control, the river system periodically contributed water and nutrients to the floodplain and supported a number of aquatic species that no longer inhabit the area.

The Rio Grande drainage in New Mexico historically supported at least 21 and perhaps 24 native fish species, representing nine or ten families (Propst 1999). Since the beginning of European settlement along the Rio Grande, this system has lost a larger proportion of its native fish fauna than any other major drainage in New Mexico. Shovelnose sturgeon (*Scaphirhynchus platorhynchus)*, longnose gar (*Lepisosteus osseus*), American eel (*Anguilla rostrata*), speckled chub (*Machrybopsis aestivalis aestivalis*), and Rio Grande shiner (*Notropis jemezanus*) have been extirpated from the Rio Grande in New Mexico, and blue catfish (*Ictalurus furcatus*), if it persists, occurs only in Elephant Butte Reservoir. Rio Grande bluntnose shiner (*Notropis simus simus*) and phantom shiner (*Notropis orca*) are extinct. Rio Grande silvery minnow (*Hybognathus amarus*) is the only state and federally protected fish species currently inhabiting the Rio Grande, but Rio Grande sucker (*Catostomus plebeius*) and Rio Grande chub (*Gila pandora*) may warrant state protection (Propst 1999).

Common fish species of the MRG include river carpsucker (*Carpiodes carpio*), flathead chub (*Platygobio gracilis*), common carp (*Cyprinus carpio*), western mosquitofish (*Gambusia affinis*), and red shiner (*Cyprinella lutrensis*) (Platania 1993). Less common fish species present in the system are channel catfish (*Ictalurus punctatus*), fathead minnow (*Pimephales promelas*), longnose dace (*Rhinichthys cataractae*), white sucker (*Catostomus commersoni*), and the RGSM. Western mosquitofish, white sucker, and common carp are introduced species that are now common throughout the MRG.

In the most intensive biological survey of the MRG to date, Hink and Ohmart (1984) found 18 different species of reptiles and amphibians in the MRG. Eastern fence lizard (*Sceloporus undulatus*), New Mexican whiptail (*Aspidoscelis neomexicanus*), and Woodhouse toad (*Bufo woodhousii*) were common and widespread. Several common species in the Middle Rio Grande, such as bullfrogs (*Rana catesbeiana*), leopard frogs (*Rana pipiens*), and Woodhouse toads, are ubiquitous throughout the state. Others, like the chorus frog (*Pseudacris triseriata*) and the common gartersnake (*Thamnophis sirtalis*), are unique to the MRG (Hink and Ohmart 1984).

Throughout the year, riparian communities of the MRG provide important habitat during breeding and migration for many bird species. Hink and Ohmart (1984) recorded 277 species of birds within 163 miles of MRG bosque habitat. Stahlecker and Cox (1997) documented 126 species in the Rio Grande Nature Center State Park (RGNCSP). They estimate that 60–65 species of birds breed most years in the park (Stahlecker and Cox 1997). The 10 most common species during the winter of 1996–1997 were dark-eyed junco (*Junco hyemalis*), American crow (*Corvus brachyrhynchos*), American goldfinch (*Carduelis tristis*), white-crowned sparrow (*Zonotrichia leucophrys*), American robin (*Turdus migratorius*), Canada goose (*Branta canadensis*), red-winged blackbird (*Agelaius phoeniceus*), mallard (*Anas platyrhynchos*), European starling (*Sturnus vulgaris*), and house finch (*Carpodacus mexicanus*). The 10 most common species in the bosque during the summer of 1997 were black-chinned hummingbird (*Archilochus alexandri*), red-winged blackbird, black-headed grosbeak (*Pheucticus melanocephalus*), spotted towhee (*Pipilo maculatus*), brown-headed cowbird (*Molothrus ater*), mourning dove (*Zenaida macroura*), Bewick's wren (*Thryomanes bewickii*), black-capped chickadee (*Poecile atricapillus*), cliff swallow (*Petrochelidon pyrrhonota*), house finch, and European starling (Stahlecker and Cox 1997). The most abundant bird species found along the river in winter were mallard, Canada goose, and wood duck (*Aix sponsa*). Red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), western screech-owl (*Otus kennicottii*),

and great-horned owl (*Bubo virginianus*) also occur in the proposed project area (Stahlecker and Cox 1997).

Hink and Ohmart (1984) recorded 35 mammal species in their study of the MRG, and Campbell et al. (1997) observed 14 mammal species in their survey of the Albuquerque Reach. Based on both surveys, the most common small mammals in the proposed project area include white-footed mouse (*Peromyscus leucopus*), western harvest mouse (*Reithrodontomys megalotis*), and house mouse (*Mus musculus*) (Hink and Ohmart 1984; Campbell et al. 1997). Large mammals in the area include coyotes, raccoons, beavers, muskrats, pocket gophers, and rock squirrels. Several species of bats also utilize the MRG.

3.8 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

The agencies that have primary responsibility for the conservation of plant and animal species in New Mexico are the USFWS, under authority of the ESA; the New Mexico Department of Game and Fish (NMDGF), under authority of the New Mexico Wildlife Conservation Act of 1974; and the New Mexico Energy, Minerals and Natural Resources Department, under authority of the New Mexico Endangered Plant Species Act. These agencies maintain lists of plant and animal species that have been classified, or are potential candidates for classification, as Threatened or Endangered (Table 3.2).

Protection from harassment, harm, or destruction of habitat is granted to species protected under the Endangered Species Act. The New Mexico Wildlife Conservation Act and New Mexico Endangered Plant Species Act protects state-listed species by prohibiting taking without proper permits.

Table 3.2. Threatened (T), Endangered (E), Species of Concern (S), Candidate (C), and Proposed (P) Plant and Wildlife Species Known to Occur in Bernalillo and Sandoval Counties, New Mexico.

Note: Animals and plants that could occur in the project area are shown in boldface.

Common Name (*Scientific name*)	**Status**		**General Habitat**
	FED	**STATE**	
Invertebrates			
William Lar's tiger beetle (*Cicindela fulgida williamlarsi*)	S	–	Montane alkali flats
San Ysidro tiger beetle (*Cicindela willistoni funaroi*)	S	–	Montane alkali flats
Slate millipede (*Comanchelus chihuanus*)	S	–	Plains mesa grassland
New Mexico silverspot butterfly (*Speyeria nokomis nitocris*)	S	–	Alpine and streamside meadows with significant violet crop
Wrinkled marshsnail (*Stagnicola caperatus*)	–	E	Ditches, streams, and marshes of the Jemez Mountains

Table 3.2. Threatened (T), Endangered (E), Species of Concern (S), Candidate (C), and Proposed (P) Plant and Wildlife Species Known to Occur in Bernalillo and Sandoval Counties, New Mexico, *continued*

Note: Animals and plants that could occur in the project area are shown in boldface.

Common Name (*Scientific name*)	**Status**		**General Habitat**
	FED	**STATE**	
Amphibians			
Jemez Mountains salamander (*Plethodon neomexicanus*)	S	T	Shady, wooded montane litter
Fish			
Rio Grande sucker (*Catostomus plebeius*)	S	–	Cool, mid-elevation streams with rocky substrates
Rio Grande silvery minnow (*Hybognathus amarus*)	**E**	**E**	**Silt and sand substrates with slow backwaters**
Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*)	S	–	Cool, high-gradient, high-elevation streams
Birds			
Northern goshawk (*Accipiter gentilis*)	S	–	Dense coniferous and mixed-woodland areas
Baird's sparrow (*Ammodramus bairdii*)	S	T	Winters in prairie areas
Western burrowing owl (*Athene cunicularia hypugea*)	S	–	Semi-arid grasslands and prairies, often associated with prairie dog towns
Common black-hawk (*Buteogallus anthracinus*)	**–**	**T**	**Woodlands along lowland streams**
Mountain plover (*Charadrius montanus*)	S	–	Semiarid grasslands and plains
Black tern *(Chlidonias niger*)	S	–	Vegetated marshes
Yellow-billed cuckoo (*Coccyzus americanus*)	**C**	**–**	**Dense riparian shrub**
Broad-billed hummingbird (*Cynanthus latirostris magicus*)	–	T	Low-elevation riparian woodlands
White-eared hummingbird (*Hylocharis leucotis borealis*)	–	T	Montane riparian areas
Southwestern willow flycatcher (*Empidonax traillii extimus*)	**E**	**E**	**Dense riparian groves of willow or salt cedar**
American peregrine falcon (*Falco peregrinus anatum)* Arctic peregrine falcon; listed for "similar appearance" (*F.p. tundrius*)	S	T	Montane species; prefers to perch in open areas, often near water.
Whooping crane (*Grus americana*)	–	E	Marshes and prairie potholes
Bald eagle (*Haliaeetus leucocephalus*)	**T**	**T**	**Winters along shores of rivers and lakes**
Neotropic cormorant (*Phalacrocorax brasilianus*)	-	T	Rivers, lakes, and reservoirs with adjacent wooded areas

Table 3.2. Threatened (T), Endangered (E), Species of Concern (S), Candidate (C), and Proposed (P) Plant and Wildlife Species Known to Occur in Bernalillo and Sandoval Counties, New Mexico, *continued*

Note: Animals and plants that could occur in the project area are shown in boldface.

Common Name (*Scientific name*)	**Status**		**General Habitat**
	FED	**STATE**	
Mexican spotted owl (*Strix occidentalis lucida*)	T	–	Mature mixed-conifer and pine-oak forests
Bell's vireo (*Vireo bellii*)	–	T	Riparian areas, piñon-juniper woodland, and Chihuahuan desert scrub
Gray vireo (*Vireo vicinior*)	–	T	Open woodlands with well-developed grasses
Mammals			
Townsend's big-eared bat (*Corynorhinus townsendii*)	S	–	Caves and rocky outcroppings in scrub deserts and piñon-juniper woodlands
Spotted bat (*Euderma maculatum*)	–	T	Rocky outcroppings, mature forests, caves
American marten (*Martes americana*)	–	T	Spruce-fir forests
Goat Peak pika (*Ochotona princeps nigrescens*)	S	–	Steep, rocky banks and hillsides above 8,000 feet
Black-footed ferret (*Mustela nigripes*)	E	–	Prairies; associated with prairie dogs
Pecos River muskrat (*Ondatra zibethicus ripensis*)	S	–	Riparian areas in Chihuahuan desert scrub and piñon-juniper woodlands
New Mexican jumping mouse (*Zapus hudsonius luteus*)	**S**	**T**	**Forb-grass communities in Jemez Mountains**
Plants			
Plank's catchfly (*Silene plankii*)	–	S	Rock outcrops
Santa Fe milkvetch (*Astragalus feensis*)	–	S	Sandy benches, gravelly hillsides, granitic and metamorphic rocks in juniper savanna or on barren areas
Knight's milkvetch (*Astragalus knightii*)	S	S	Dakota sandstone rimrock ledges in piñon-juniper woodlands
La Jolla prairie clover (*Dalea scariosa*)	–	S	Sandy clay banks and bluffs, often disturbed
Sapello Canyon larkspur (*Delphinium sapellonis*)	–	S	Montane areas in the Sandia Mountains
Sandia Mountain alumroot (*Heuchera pulchella*)	–	S	Rock outcrops in montane areas
Gypsum phacelia (*Phacelia* sp. nov.)	S	–	Gypsum outcrops
Parish's alkali grass (*Puccinellia parishii*)	S	E	Alkali springs, seeps, and drainages
Gypsum Townsend's aster (*Townsendia gypsophila*)	S	S	Weathered gypsum outcrops, gypsiferous soils

Information taken from NMDGF 2004a; NMRPTC 1999; Sublette et al. 1990; USFWS 2004.

3.8.1 FISH

Rio Grande Silvery Minnow *(Hybognathus amarus)*
The RGSM is a moderate-sized, stout minnow, reaching 3.5 inches in total length, that spawns in the late spring and early summer, coinciding with high spring snowmelt flows (Sublette et al. 1990). Spawning also may be triggered by other high-flow events such as spring and summer thunderstorms. The species is a pelagic spawner, producing neutrally buoyant eggs that drift downstream with the current (Platania 1995). The eggs hatch in 2 to 3 days, and the larvae may continue to drift or become retained in backwaters or embayments. The species normally lives about 2 to 3 years in the wild. Natural flow regimes, movement within their limited remaining range, and habitat diversity are important to completion of the life cycle.

In 1994, the RGSM was classified as Endangered by the USFWS (FR 1994a) and has been considered Endangered at the state level since 1979. Historically, the RGSM was one of the most widespread and abundant fishes in New Mexico. The species has declined as a result of impacts from dewatering, channelization and flow regulation for irrigation, diminished water quality, and competition/predation by non-native species. The species is endemic to New Mexico, where it historically occupied large rivers with shifting sand substrates. In the Rio Grande, the RGSM ranged from the confluence of the Rio Chama near Española to the Gulf of Mexico, and in the Pecos River from near Santa Rosa to its confluence with the Rio Grande (Propst 1999). The RGSM currently occupies less than 10 percent of its historic range and is found only in the Rio Grande from Cochiti Reservoir downstream to Elephant Butte Reservoir (Propst 1999).

Natural habitat for the Rio Grande silvery minnow includes stream margins, side channels, and off-channel pools where water velocities are lower than in the main channel. Areas with detritus and algal-covered substrates are preferred. The lee sides of islands and debris piles often serve as good habitat. Stream reaches dominated by straight, narrow, or incised channels with rapid flows would not typically be occupied by the RGSM (Sublette et al. 1990; Bestgen and Platania 1991). Critical habitat for the RGSM was designated by the USFWS from the Highway 22 Bridge downstream to the headwaters of Elephant Butte Reservoir, including the Albuquerque Reach. This designation became effective February 19, 2003 (FR 2003b). Constituent elements of critical habitat required to sustain the Rio Grande silvery minnow include, in brief: (1) A hydrologic regime that provides sufficient flowing water...capable of maintaining a diversity of aquatic habitats; (2) The presence of eddies...that provide a variation of habitats; (3) Substrates of predominantly sand or silt; and (4) Water of sufficient quality to maintain...variable water temperatures (USFWS 2003).

A Biological Opinion was released by the USFWS in 2003 covering Reclamation's water and river maintenance operations, the USACE's flood control operations, and Related Non-federal Actions on the MRG (USFWS 2003). The 2003 MRG BO requires habitat restoration projects on the MRG that will improve survival of all life stages of the endangered RGSM and other endangered species. The 2003 MRG BO identified the need for increased availability of low-velocity habitat and silt and sand substrates to provide food, shelter, and sites for reproduction for RGSM and thereby alleviate jeopardy to the continued existence of the species in the MRG.

RGSM populations within this reach have been monitored on an ongoing basis by UNM and the USFWS. Generally, the data collected indicate that RGSM are rare throughout the reach, with many of the individuals collected being adults (Dudley et al. 2003). This data set indicates that the population may benefit by retaining eggs, larvae, and juveniles in upstream areas like the Albuquerque Reach, where they can contribute to the population growth and aid in the recovery of the species.

3.8.2 BIRDS

Common Black-hawk *(Buteogallus anthracinus)*
The common black-hawk is listed as Threatened by the State of New Mexico and may occur in the Albuquerque Reach (NMDGF 2004b). Though the common black-hawk is considered rare in Bernalillo County, nesting was observed in the Isleta Reach during the summer of 2003 (Williams 2003). The species primarily occupies riparian woodlands, particularly areas with well-developed cottonwood galleries, or a variety of woodland and marsh habitats along permanent lowland streams. Breeding black-hawks require mature riparian forest stands near permanent water. Most birds winter south of the U.S., although some records report occurrences within southern Arizona and the Gulf coast in Texas. The diet of this riparian-obligate species consists mainly of fish, insects, crayfish, amphibians, and reptiles, but occasionally they will take small mammals and birds. Loss of riparian habitat poses the greatest risk to the species. In 1996 the NMDGF estimated 60 to 80 breeding pairs in the state.

Yellow-billed Cuckoo *(Coccyzus americanus occidentalis)*
The yellow-billed cuckoo is a USFWS Candidate species that occurs locally along riparian corridors throughout New Mexico. Ideal habitat appears to be dominated by cottonwood canopy with a well-developed willow understory. Yellow-billed cuckoo diet consists mainly of caterpillars but may also include various insects, some fruit, and the occasional lizard or frog (NMDGF 2004c). The breeding range of yellow-billed cuckoo extends from California and northern Utah north and east to southwestern Quebec and south to Mexico. In New Mexico, historical accounts indicate that the yellow-billed cuckoo was locally very common along the Rio Grande, but rare statewide (NMDGF 2004c). Both Hink and Ohmart (1984) and Stahlecker and Cox (1997) reported yellow- billed cuckoo as a nesting bird in the bosque of the Middle Rio Grande.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)
The southwestern willow flycatcher is considered Endangered by both the USFWS and the State of New Mexico. The subspecies is restricted to dense riparian vegetation along select waterways in New Mexico, Arizona, western Texas, southern Utah, Nevada, and California. The decline of the species has been attributed to loss of riparian habitat, brood parasitism, and lack of adequate protective regulations. The historic range of southwestern willow flycatchers included riparian areas throughout Arizona, California, Colorado, New Mexico, Texas, Utah, and Mexico. Critical habitat was designated for the flycatcher in 1997 (FR 1997) along 599 miles of streams and rivers in California, Arizona, and New Mexico, but was later withdrawn. In October 2004, the USFWS proposed a new designation of critical habitat for the flycatcher (FR 2004). The southwestern willow flycatcher prefers dense riparian thickets, typically willows with a scattered cottonwood overstory. Dense riparian woodlands are particularly important as breeding habitat.

In New Mexico, the flycatcher occupies riparian habitat along the Rio Grande, Rio Chama, Zuni River, San Francisco River, and Gila River drainages and is generally found within 150 feet of a water source. During spring and fall migration the species occurs statewide, although migration patterns are not well understood. On the Rio Grande, the subspecies occurs near Velarde, Isleta, the Sevilleta NWR, the Bosque del Apache NWR, San Marcial, and Fort Selden.

Bald Eagle (*Haliaeetus leucocephalus*)
This species is listed as Threatened by both the USFWS and the State of New Mexico. Bald eagles are associated with habitats near open water. In New Mexico, bald eagles commonly winter adjacent to rivers and lakes, or where carrion is available. The major food items of bald eagles in New Mexico are waterfowl, fish, and carrion (NMDGF 2004d). Bald eagles are uncommon during the summer and have limited breeding sites in New Mexico, though nests have been documented in the extreme northern and western portions of the state. The number of birds wintering in the state has been steadily increasing. Important wintering areas include the upper Rio Grande, but seldom the Middle Rio Grande. The bald eagle commonly winters along the Rio Grande between the Buckman diversion point and Cochiti Reservoir.

3.8.3 MAMMALS

New Mexican Jumping Mouse (*Zapus hudsonius luteus*)
The New Mexican jumping mouse (*Zapus hudsonius luteus*) is listed by the USFWS as a Species of Concern and is considered Threatened by the State of New Mexico. Also known as the New Mexico meadow jumping mouse, the species is endemic to New Mexico and Arizona. The New Mexican jumping mouse is restricted to mesic habitats, preferring permanent streams, moderate to high soil moisture, and dense and diverse streamside vegetation consisting of grasses, sedges, and forbs (NMDGF 2004e). In the Rio Grande Valley, the species occurs mainly along the edges of permanent ditches and cattail stands. The proposed project area does not contain any wetland areas with cattails or dense herbaceous vegetation. Recent surveys (Hink and Ohmart 1984) have failed to detect the New Mexican jumping mouse north of Isleta Marsh. It is therefore unlikely that the species occupies either the riparian floodplain or any in-channel islands of the Middle Rio Grande.

3.9 SOCIOECONOMICS

This analysis does not focus on all aspects of economics within the proposed project area, but considers only the projected economic costs of the Preferred Alternative and economic statistics at the state, county, and local levels to describe the economic context of the Project.
In 2000, Bernalillo County had a per capita personal income (PCPI) of $27,253 and Sandoval County had a PCPI of $22,247. The average PCPI for the State of New Mexico was $21,931, which was 75 percent of the national average, $29,469 (U.S. Census Bureau 2004a,b). Average annual growth in PCPI was 3.9 percent for the State of New Mexico and 4.2 percent nationwide.

The proposed project location encompasses Bernalillo and Sandoval Counties in the State of New Mexico. According to the 2000 Census, New Mexico had a population of 1,819,046, with 556,678 persons residing in Bernalillo County and 89,908 persons in Sandoval County. Bernalillo County is approximately 1,166 square miles in area, with an average of 477 persons

per square mile, and is considered urban in character. Sandoval County is considered rural in character, with one minor urban center. The Town of Bernalillo (6,611) and the City of Rio Rancho (51,765) had a combined population of 58,376 in 2000.

Federal expenditures in the State of New Mexico accounted for $17,478 Billion in 2002 (U.S. Census Bureau 2002). State expenditures amounted to $63,611 Million in 2002 (New Mexico Department of Finance and Administration 2002). The estimated cost of the Proposed Action is $500,000 to $1,500,000 depending on funding availability.

3.10 VISUAL AND AESTHETIC RESOURCES

The bosque area within Albuquerque is valued for the visual and aesthetic appeal of mature forest and flowing water in an arid landscape. The riparian areas are designated as the Rio Grande Valley State Park (RGVSP) through the Park Act of 1983, which is managed by the City of Albuquerque Open Space Division and the Middle Rio Grande Conservancy District (MRGCD). The 5,000-acre RGVSP extends through the City of Albuquerque, from Sandia Pueblo on the north to the Pueblo of Isleta on the south (RGVSP 2004). The bosque within Corrales is designated as the Corrales Bosque Preserve and is managed by the Village of Corrales and the Corrales Bosque Commission through an agreement with, and oversight from, the MRGCD. Sandia Pueblo lands are managed and controlled by the Pueblo.

The bosque and river are visible to the public from many bridge crossings, such as at the Alameda Bridge, Montaño Bridge, Central Avenue Bridge, César Chavez Bridge, and Rio Bravo Bridge. These bridge vistas of the river and bosque provide thousands of urban residents with a regular and important visual aesthetic experience. The bosque and river are also visible and enjoyed for the aesthetic value from many foot and horse trails. Trails within the Rio Grande Bosque exist on both sides of the river, with a 16-mile-long paved trail on the east side of the river. Recreation activities include, but are not limited to, walking, jogging, bicycling, roller-blading, horseback riding, fishing, and wildlife watching. No motorized vehicles except maintenance and emergency vehicles are allowed in the bosque, making the aesthetic experience of the recreating public one of a forest and riverside that is full of the sounds and sights of water and forest.

3.11 AIR QUALITY AND NOISE

The proposed project area lies within New Mexico's Air Quality Control Region No. 152. This region includes Sandoval County and most of Valencia County, which are in attainment for all criteria pollutants (carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur oxides) of the National Ambient Air Quality Standards (New Mexico 2004). Bernalillo County also falls in Region No. 152 and is in attainment for all priority pollutants except carbon monoxide, which is presently in maintenance status (Macias, *personal communication* 2005). The closest Class I area (a national park or wilderness area) is Bandelier National Monument, 50 miles north of the proposed project area. Air quality in the project area is considered to be good. Due to inversions and an increase in the use of wood-burning stoves, carbon monoxide and airborne particulates are occasionally high in the Rio Grande Valley during winter months. All vehicles involved in project activities would have emission control equipment that has passed

City of Albuquerque emissions tests. A fugitive dust permit would be obtained from the City of Albuquerque, and Best Management Practices (BMPs), such as wetting down disturbed areas to minimize dust, would be followed during project activities.

Noise levels are limited to 90 decibels A-weighted (dBA) averaged over an 8-hour day by the Occupational Safety and Health Administration (OSHA) (29 CFR 1910.95). No worker may be exposed to 115 dBA averaged over an 8-hour day without hearing protection. City of Albuquerque (COA) (1975) noise standards require that powered equipment be operated only between the hours of 7 am and 10 pm Monday through Saturday and 9 am to 10 pm on Sundays (City of Albuquerque 1975).

3.12 NET WATER DEPLETIONS

The Rio Grande Compact limits the amount of surface water that can be depleted (consumed) annually in the MRG based upon the natural flow of the river measured at the Otowi gage near Los Alamos (Rio Grande Compact 1939). In addition, the New Mexico State Engineer has determined the MRG is fully appropriated. Therefore, any increase in water use in one sector of use must be offset by a reduction in use in another sector such that senior water rights or New Mexico's ability to meet its downstream delivery obligations are not impaired. Therefore, the New Mexico State Water Plan (Office of the State Engineer/Interstate Stream Commission 2003) requires that habitat restoration projects either will not result in increases in net water depletions, or that any increases are offset by purchased or leased water rights. All the projects proposed for habitat restoration herein will be designed and constructed so as not to increase water depletions.

3.13 ENVIRONMENTAL JUSTICE

Executive Order 12898 (FR 1994b), Environmental Justice in Minority and Low-Income Populations, requires consideration of adverse impacts that would disproportionately affect minority and low-income populations. Compared to demographics on the national level, the population of Sandoval and Bernalillo Counties has proportionately more persons of Hispanic and Native American background and fewer persons of African-American or Asian background. Ethnic comparisons in the State of New Mexico are proportionately similar to Sandoval and Bernalillo counties. It should be recognized that persons of Hispanic background might also claim identification with another ethnic group as well.

3.14 INDIAN TRUST ASSETS

Indian Trust Assets (ITAs) are legal interest in assets held in trust by the United States Government for Indian tribes or for Indian individuals. Some examples of ITAs are lands, minerals, water rights, hunting and fishing rights, titles and money. ITAs cannot be sold leased, or alienated without the express approval of the United States government. Secretarial Order 3175 and Reclamation ITA policy require that Reclamation assess the impacts of its projects on ITAs. An inventory of all ITAs within the proposed project area is required. If any ITAs are impacted, the mitigation or compensation for adverse impacts to these assets must be accomplished.